MID-TERM REVIEW

Impacts of sediment contaminants from urban construction on stream health

Healthy Waterways Strategy 2018-2028
Port Phillip & Westernport, Victoria

Melbourne Water

RMIT A3P UNIVERSITY

Strategic alignment

Regional Performance Objective

RPO 17: Water quality in waterways and bays is improved by reducing inputs of sediment and other pollutants from urban construction and development.

RPO 24: Risk-based programs are in place to mitigate sources of urban pollution (licenced and unlicensed discharges) to protect bays and waterways.

Key Research Areas

Stormwater management and flooding:
Improving stormwater treatment performance and determining the optimal maintenance of WSUD systems.

Water Quality:
Understanding the environmental impacts of pollutants, including contaminants of concern, to inform risk-based management of waterways across the region.

Summary

This project focuses on understanding the levels of sediment pollutants from new residential developments and the potential ecological impacts to receiving rivers and bays. Sediment sources, deposition, accumulation and effects on aquatic life were investigated given the potentially significant potential implications for the health of rivers, estuaries and bays. In addition, typically associated with sediments are pollutants which can increase ecological impacts. Therefore, it is important to not only understand the effects of sedimentation, but also associated pollutants to ensure cost effective management programs are developed.

Recommendations

- Raise awareness and support implementation of EPA's revised Civil construction, building and demolition guide Publication 1834.1 including Guidance Sheet 4: Termite pesticide.
- Investigate opportunities to improve approaches to sediment control and dust suppression during and after stages of urban development when termite control chemicals are applied.
- Increase understanding of pest industry, property developers, builders, waterway managers, community and owners of new houses about pollution pathways i.e. stormwater and airborne/dust routes.

What did we do?

Pollutants in new residential urban developments

Stormwater wetlands (four) and associated receiving waters (three) have been monitored for sediment-bound pollutants (metals and pesticides) and water pollutants (pesticides) using passive samplers in the southeastern suburbs of Greater Melbourne. The study catchment is a mixture of different stages of construction, with some sections of complete houses and some areas of pre-development. Sampling began in November 2019 and was repeated every 6 months through the different phases of housing construction, being 'Pre-development', 'Bulk earthworks', 'House construction', 'Landscaping' & 'Completion'. Site were upstream and downstream of the housing development to capture the effect of the development activities.

What did we find?

Pollutants in new residential developments

The creek and surrounding wetlands had low levels of metals in sediment across all sites, compared to ANZGwater quality guidelines for environmental protection (ANZG, 2018). On the other hand, the insecticide, bifenthrin (currently used for termite control in new housing estates) was detected in all the wetlands, except for the most recently built wetland, at concentrations that may cause toxic effects to invertebrates (Figure 1a). As designed to protect downstream natural waterways, the stormwater wetlands are capturing the majority of sediment and pollutants coming from the residential estate. Bifenthrin was also detected in the creek downstream of the estate, suggesting that flooding of wetlands during high rain fall events may have contributed to this pollutant being found downstream (Figure 1b). Dust samples within the estate were also collected and analysed for bifenthrin. Several locations within the estate contained high concentrations of bifenthrin suggesting that, not only can bifenthrin enter waterways through surface runoff, it may also be contaminating waterways via dust particles. The passive samplers found several herbicides, fungicides and insecticides within the creek, particularly downstream of the urban estate and in each of the stormwater wetlands. Results of total suspended sediment levels during storm events found some high concentrations of bifenthrin, suggesting it can also be transported during wet weather.

These results are consistent with other studies in the region that found bifenthrin across the majority of stormwater wetlands tested, with the highest concentrations in new urban areas (Pettigrove et al. 2023).

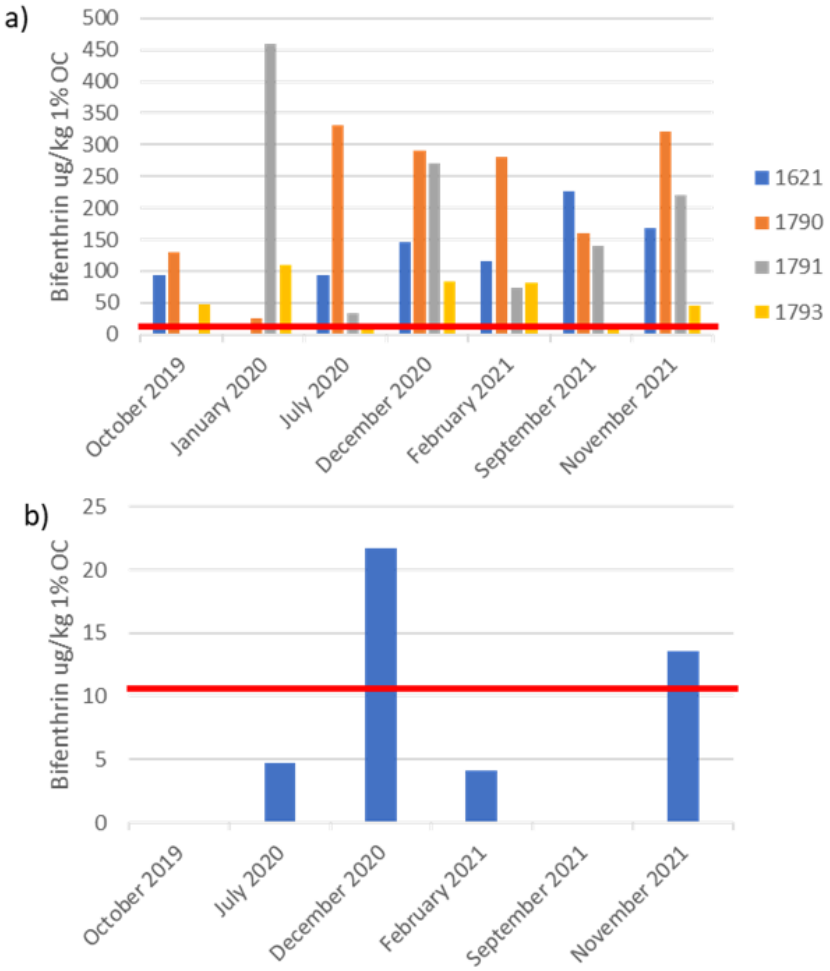

Figure 1. a) Bifenthrin concentrations across four wetlands in the southeastern suburbs of Greater Melbourne. b) Bifenthrin concentrations in the creek downstream of the residential development site. Any value above the red line has the potential to be harmful to aquatic fauna (Jeppe et al. 2017).

Key Outcome: Bifenthrin is consistently detected in wetlands of new housing estates in concentrations that are likely to may be toxic to invertebrates (and potentially other aquatic life). Bifenthrin is transported via surface runoff and dust particles, and may bypass stormwater wetlands into downstream natural waterways.

Future direction and knowledge gaps

Effects of Bifenthrin on Aquatic Organisms

Currently there is little information on how sediment bound synthetic pyrethroids affect a broader range of aquatic life, including zooplankton, amphibians and fish. Research is currently underway focussing on urban wetlands and their suitability for threatened Growling Grass Frogs and Dwarf Galaxias.

New EPA Urban Construction Guidelines

Raise awareness and support the implementation of new guidelines. This research has informed EPA's revised Civil construction, building and demolition guide Publication 1834.1 including Guidance Sheet 4: Termite pesticide. This is a very good example of government adoption of our research findings.

For further information on this project, or other projects of the A3P, please contact:

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